

Safety Technologie for mobile Construction Machinery

- Load Holding Valves
- Load Control Valves
- Brake Valves
for Cylinder- and Motor Applications

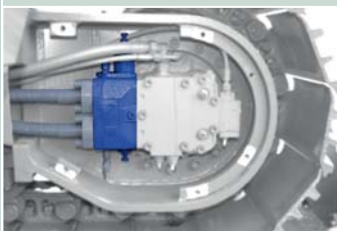


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1. Load Control Valves usable for lifting Cylinders, telescopic Cylinders and luffing Cylinders



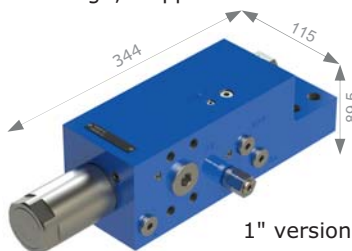
In case of a pipe or tube rupture the load control valve avoids uncontrolled movement of the cylinder. In various countries these valves are required by law when the construction machine is used for load lifting purposes. WESSEL load control valves stand for an excellent sensitivity and a very direct response to the joystick stroke.

Highlights:

- symmetrical structure of the ports
- filter screen in front of the pressure valve
- connection port for balance line
- maximum lowering speed adjustable (optional)
- leakage free
- complies with the requirements of standard DIN 24093, ISO 8643, EN 474
- Opening level independent from load pressure
- small hysteresis

1.1 Designs

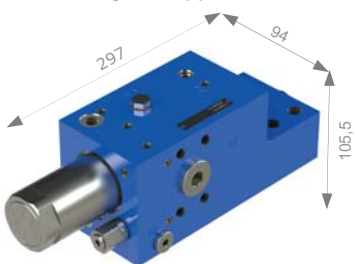
Design 3N
flat design, stepped



SAE 1/2", 3/4", 1" flange design according to ISO 6162

This load control valve is available for port sizes of SAE 1/2" to SAE 1" for maximum volume flow (Q_Z max) up to 400 l/min (100 usgal/min). For detailed information see datasheet LHB-3N.

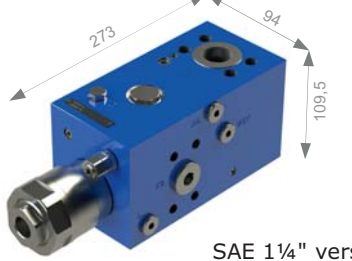
Design 3S
short design, stepped



SAE 1" flange design according to ISO 6162

For applications with critical space availability the short design of the SAE 1" valve is used. Maximum volume flow (Q_Z max) up to 400 l/min (105 usgal/min). For detailed information see datasheet LHB-3S.

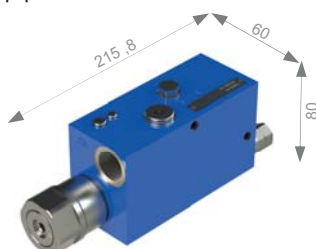
Design 3K
compact design



SAE 1", 1 1/4" flange design according to ISO 6162

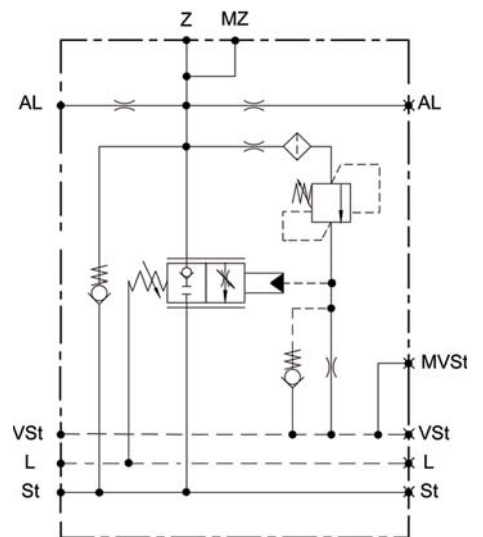
For applications with smallest available space. E.g.: telescopic cylinders in mobile cranes. Maximum volume flow (Q_Z max) up to 600 l/min (160 usgal/min). For detailed information see datasheet LHB-3K.

Design 3P
pipe connection



G3/4 connection according to ISO 1179-1

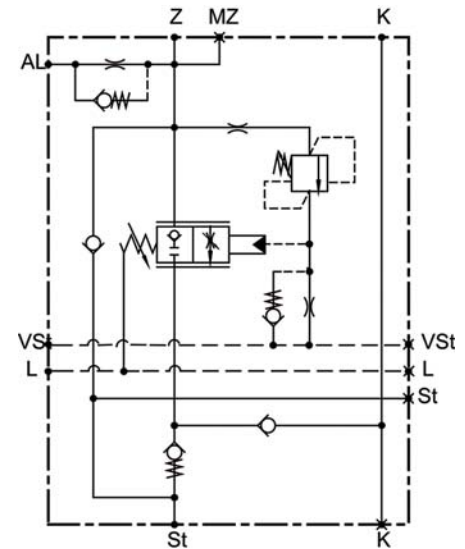
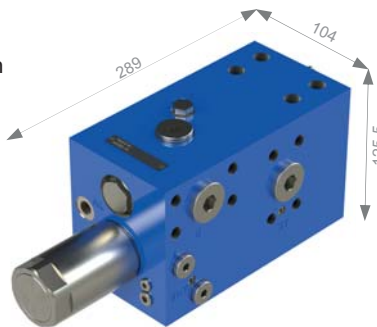
This valve is not being flanged onto the cylinder, but connected with pipes. Maximum volume flow (Q_Z max) up to 150 l/min (40 usgal/min). For detailed information see datasheet LHB-3P.



1.1 Designs

Design 3R
energy saving by means of regeneration capability

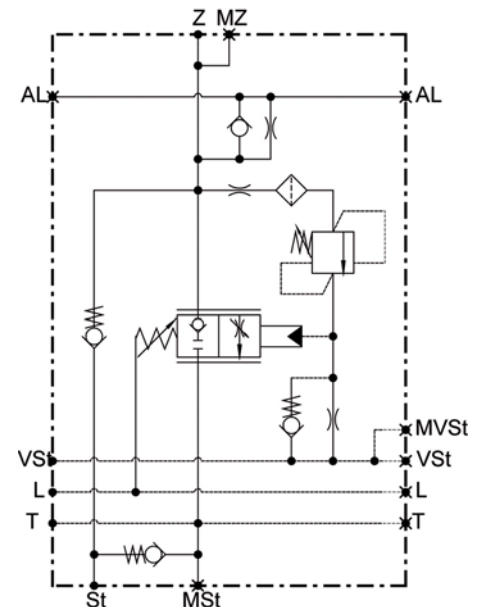
SAE 1" flange design according to ISO 6162



This load control valve performs an internal regeneration circuit. The returning volume flow is dammed up by an internal check valve and routed to the rod side of the cylinder when needed (port K). With that the lifting cylinder can be retracted without additional volume flow from the pump. The maximum allowable volume flow (QZ max) is 400 l/min (105 usgal/min). For detailed information see datasheet LHB-3R.

Design 3T
high cylinder speed

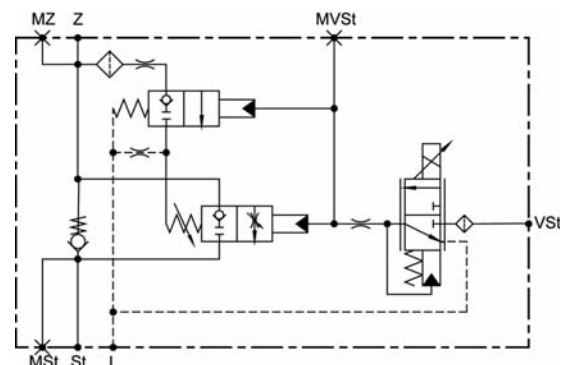
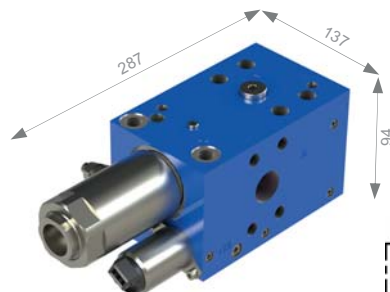
SAE 1" flange design according to ISO 6162



This design is equipped with an additional drain port for the returning volume flow. With that high cylinder speed can be achieved even if the main control valve only shows small cavities for the return volume flow. The maximum allowable volume flow (QZ max) is 550 l/min (145 usgal/min). For detailed information see datasheet LHB-3T.

Design 3E
load compensated

SAE 1" flange design according to ISO 6162



This design offers the feature of load compensation. When using pipe rupture valves of the designs before, the volume flow from the cylinder increases with enhanced pressure. Pipe rupture valves according to this design are able to compensate or even over-compensate this effect. This valve is piloted hydraulically or electrical proportional. Typical applications for this valve are luffing cylinders in mobile cranes. The maximum allowable volume flow (QZ max) is 400 l/min (105 usgal/min). For detailed information see datasheet LHB-3E.

1.2 Description

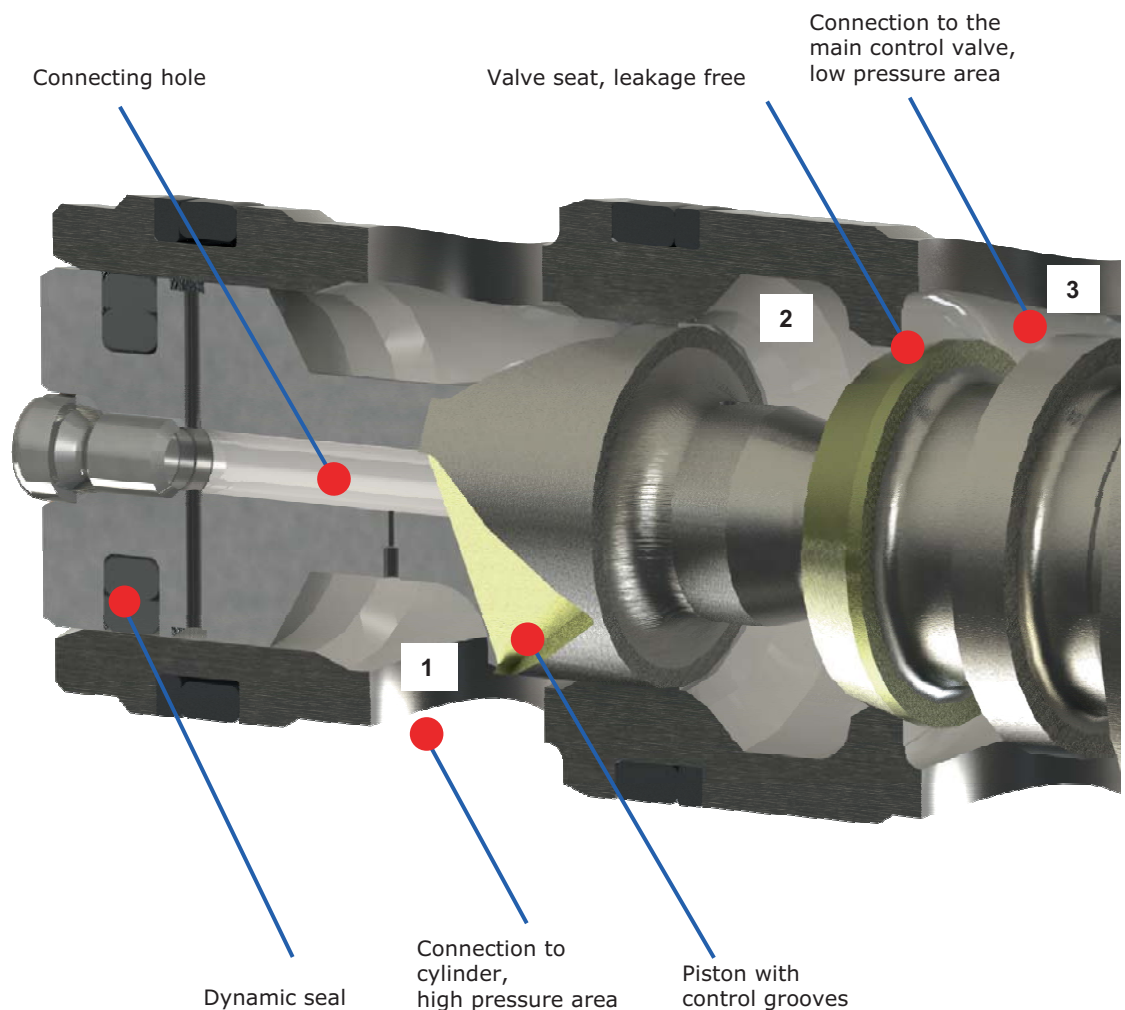
Patented technique pays out

In order to achieve a direct response of the load control valve, big efforts are being taken: While load control valves of conventional design only the valve seat locks between the high pressure (1) and the low pressure area (3), the WESSEL-HYDRAULIK valves show an additional transition cavity (2). That cavity separates the valve seat from the control grooves of the valve piston. When the valve seat starts to open the pressure in the transition cavity is released abruptly and the cylinder pressure is kept on the control grooves of the piston. Simultaneously the pressure in the connection hole drops to low pressure level: The dynamic seals on the piston are released from high pressure. That the seal never has to work under pressure and can thus not wear, is a positive side effect!

Highlights

- opening level of the load control valve is independent from the loadpressure
- even with high loads there is no sudden reach
- the piston opens with almost no hysteresis and the operator has a quite direct handling of the load

Ideal conditions for construction machine jobs which require excellent accuracy!



1.3 Type Code

LHB																	
00	01	02	03	04	05	06	07	08									
00	Product group	load control valves						LHB									
01	Design	<table border="1"> <tr> <td>3N</td> <td>3S</td> <td>3P</td> <td>3K</td> <td>3R</td> <td>3T</td> <td>3E</td> </tr> </table>							3N	3S	3P	3K	3R	3T	3E		
3N	3S	3P	3K	3R	3T	3E											
02	Cylinder Port		SAE 1/2"	SAE 3/4"	SAE 1"	SAE 1 1/4"	G 3/4										
		Code61	○	04C	04E	○	03E										
		Code62	05A	05C	05E	05G											
03	Control Piston (Nominal volume flow at approx. 50bar Δp) l/min		150	200	250	300	350	400	500	600							
		1/2"	■	○	○	○	○	○	○	○							
		3/4"	○	■	■	■	○	○	○	○							
		1"	○	○	■	■	■	■	○	○							
		1 1/4"	○	○	○	■	■	■	■	■							
		G 3/4	■	○	○	○	○	○	○								
04	Pressure setting in bar	Opening level pressure valve at 10l/min					...	350	420								
05	Activation		HYP03B hydraulic proportional			24P002 24VDC proportional AMP Junior Timer connector											
		3N	■						○								
		3S	■						○								
		3P	■						○								
		3K	■						○								
		3R	■						○								
		3T	■						○								
3E	■						■										
06	Opening level	Design 3N, 3S, 3P, 3K, 3R, 3T						bar	008								
								Design 3E	mA	400							
07	Compensation setting		00 no compensation	01 undercompensated	02 compensated	03 overcompensated											
		3N	■	○	○	○											
		3S	■	○	○	○											
		3P	■	○	○	○											
		3K	■	○	○	○											
		3R	■	○	○	○											
		3T	■	○	○	○											
3E	○	■	■	■													
08	maximum lowering speed adjustable	yes						1									
		no						0									

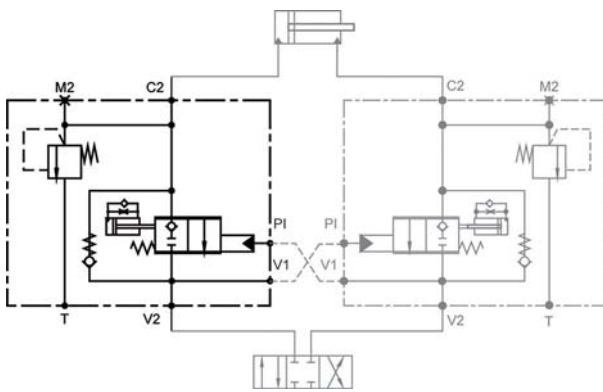
XXX – Predetermined characteristics XXX- Characteristics selectable by customer ■ available ○ not available

2. Load Control Valves usable for oscillation-prone Cylinder Applications

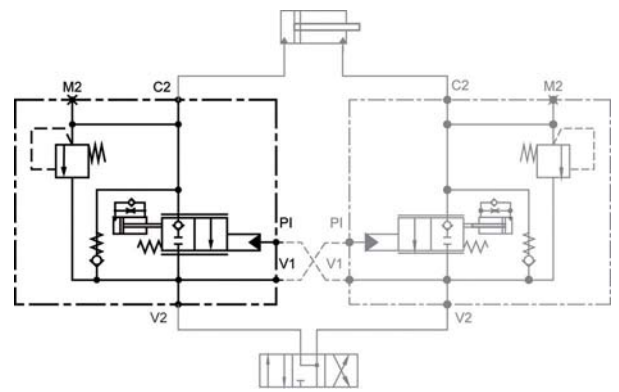


Usable for oscillation-prone cylinder-applications operating at volume flows up to 60 l/min (16 usgal/min) and a maximum pressure of 450 bar (6500 psi)

Multi-sectional booms moved by cylinders often tend to oscillations. When the damping is insufficient this problem might also be caused by the piloting of the cylinder. Any thereby caused reduction of the movement speed or pressure clamping of the cylinder is not necessary when using WESSEL valves.
Hardened steel for housing and pistons ensure high durability and reliability!



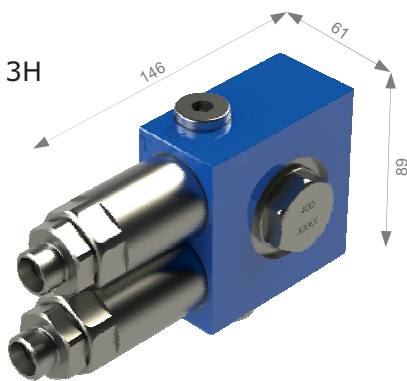
Pressure valve type T: The pressure limiting valve is connected to a separate tank line (recommended)



Pressure valve type V: The pressure limiting valve is connected to port V2

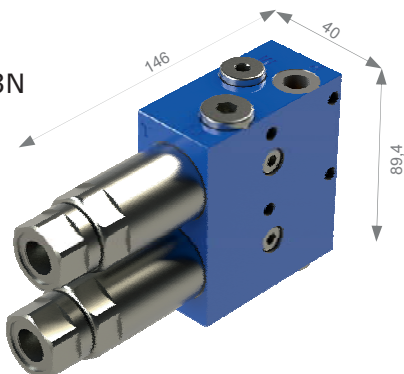
2.1 Designs

Design 3H



The valve is connected to the cylinder ports via a hollow connecting screw

Design 3N



The valve is flanged onto the cylinder by means of four bolts

2.2 Description

The leakage free valve consists of three main components:

Check valve

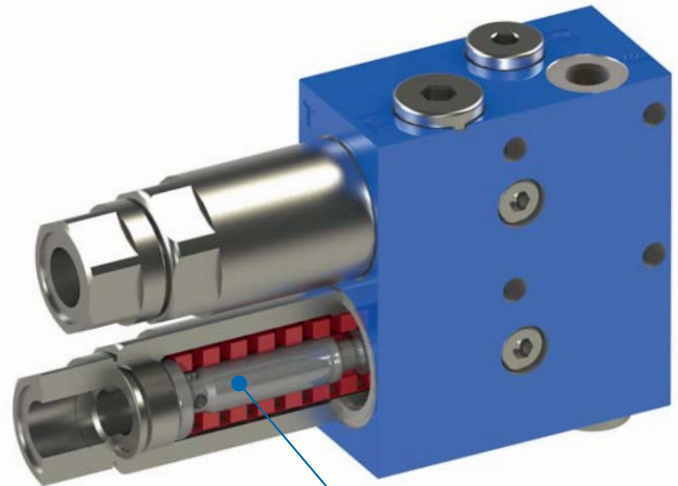
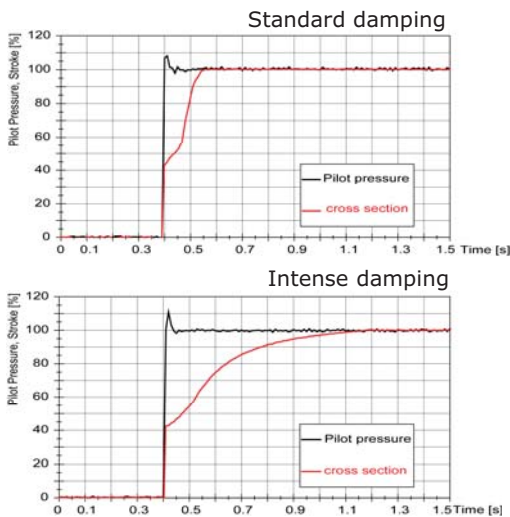
- leakage free and low loss

Brakevalve piston

- By means of a well tuned spring-piston characteristic and special damping measures the piston opens very smoothly
- opening level is independent from the load pressure

Pressure valve

- pressure setting up to the maximum occurring load pressure



Damping cartridge ensures oscillation free hydraulics

2.3 Type Code

LHC								
00	01	02	03	04	05	06	07	
00	Product group	Lowering brake check valve					LHC	
01	Design	Mounted onto the cylinder and connected via a hollow connecting screw					3H	
		Flange-mounted onto the cylinder by four bolts					3N	
02	Port size of spring cap port T	AD12L					10F	
		M14x1,5					01D	
		G 1/4					03B	
		G 3/8					03C	
03	Port size of spring cap port V	AD12S					10M	
		AD12L					10F	
		M14x1,5					01D	
		G 1/4					03B	
		G 3/8					03C	
04	Nominal volume flow	l/min			10	20	40	60
05	Pressure valve setting	(<200bar ≤450bar)			300	350	400	450
06	Damping	standard damping					01	
		strong damping					02	
07	Pressure relief opens to ...	tank	T1, V1, V open T closed		T0			
			T, V1, V open T1 closed		T1			
		return line	T1, V1 open T, V closed		T2			
			V, V1 open T, T1 closed		V0			

XXX – Predetermined characteristics XXX- Characteristics selectable by customer ■ available ○ not available

Load Control Valves usable for Hydraulicmotors



Load control valves are suitable for motor-applications. The consumer is locked leakage free. Opening is done independently from load pressure and controlled by the pressure of the opposite side. By that it is ensured, that the consumer cannot go ahead. These valves are used for oscillation-prone applications as e.g. which drives and stand out for an excellent sensitivity and a very direct response to the joystick movement.

Highlights:

- Leakage free
- Load pressure independent opening
- small hysteresis
- optional pressure valve / "sunshine valve"
- quick closing performance
- damped opening performance

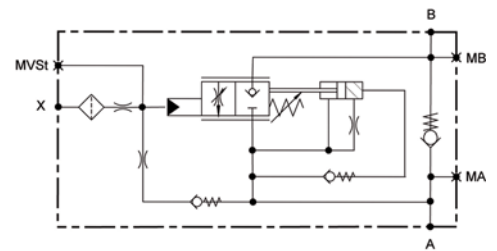
3.1 Designs

Design 3N Standard

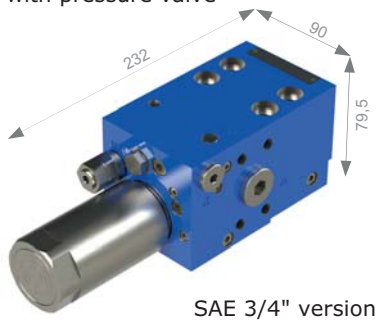


SAE 3/4", 1" flange design according to ISO 6162

This load control valve is available as SAE 3/4" and SAE 1" version. The maximum allowable volume flow (Qmax) is up to 400 l/min (105 usgal/min). For detailed information see datasheet LHW-3N.

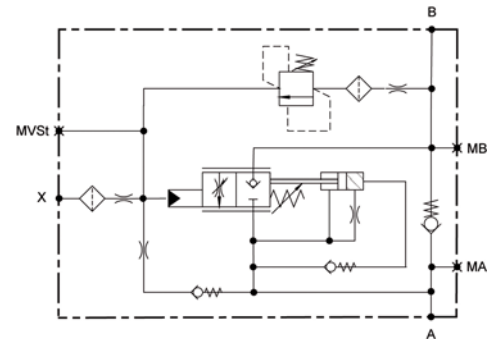


Design 3P with pressure valve

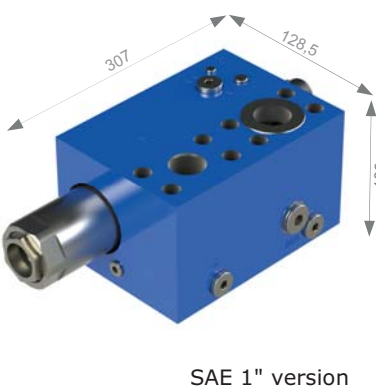


SAE 3/4", 1 1/4" flange design according to ISO 6162

This load control valve is available as SAE 3/4" and SAE 1 1/4" version. The maximum allowable volume flow (Qmax) is up to 600 l/min (160 usgal/min). For detailed information see datasheet LHW-3P.

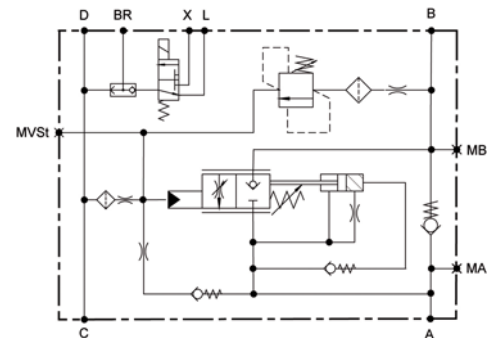


Design 3D Double-flange



SAE 1", 1 1/4" flange design according to ISO 6162

This load control valve is available as SAE 1" and SAE 1 1/4" version. The maximum allowable volume flow (Qmax) is up to 600 l/min (160 usgal/min). For detailed information see datasheet LHW-3D. The design 3D is suitable for double-flange hydromotors, e.g. motors type A2FM from manufacturer Rexroth. The detecting of the signal for "lowering" is done internally. That avoids additional external piping. The brake-side of the motor is protected by means of a pressure relief valve. Moreover a brake vent valve is included. It can open the mechanical winch-brake either with an internal signal or switchable with an external pressure.



3.2 Description

Plug and Play

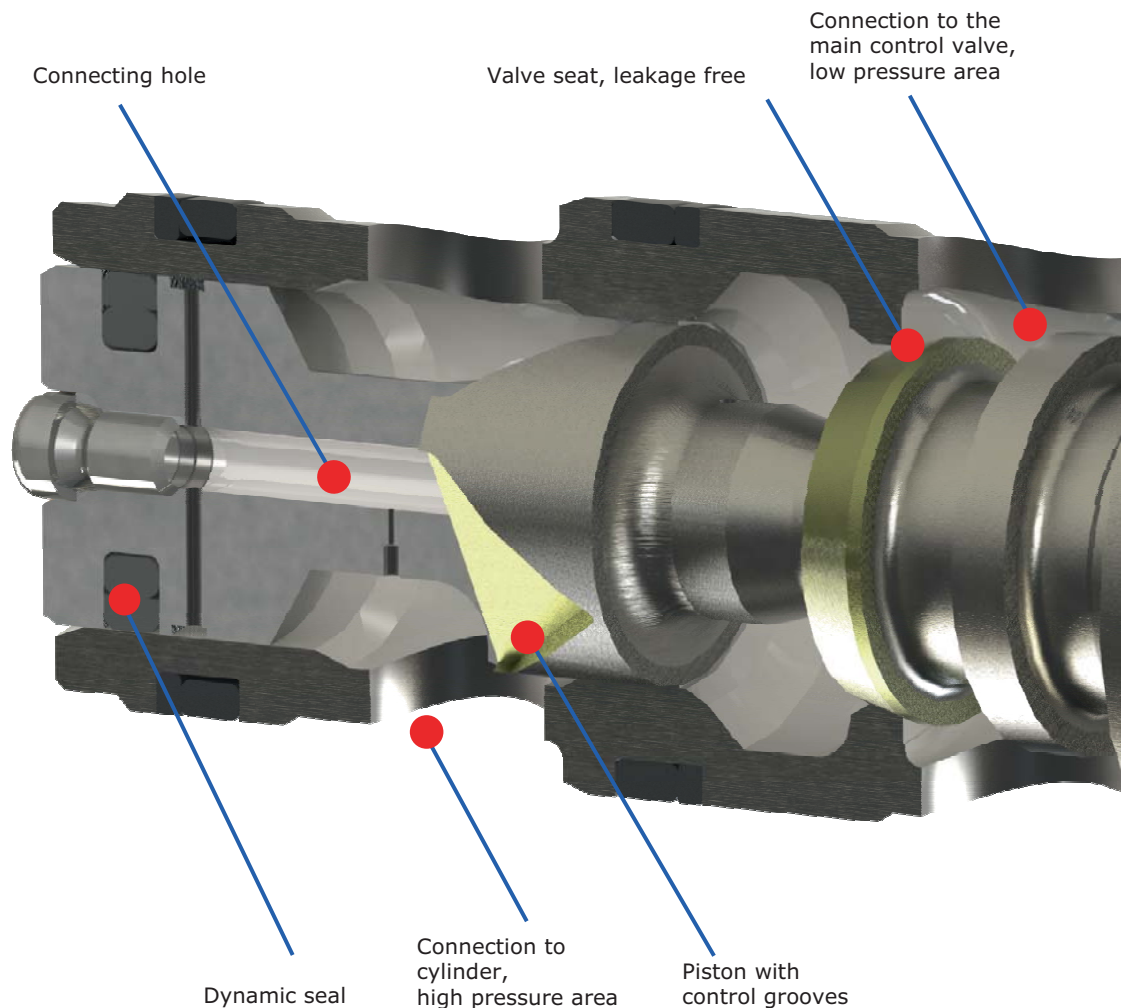
WESSEL load control valves are optimized for oscillation-prone applications, as the valves are working with special measures for damping. A slight opening of the valve is always done with a low damping. By this a fast reaction of the valve is achieved without clamping in the hydromotor. Increasing control pressure also causes damping to increase. A fast closing of the valve is always guaranteed, in order to attain a quick response to the operators command and to keep a great safety standard.

Highlights

- quick setting to work optimized damping performance for challenging applications
- modification of damping performance does not affect the opening level

Moreover the patented technique of the WESSEL load control valves type LHB is also used in WESSEL load control valves type LHW.

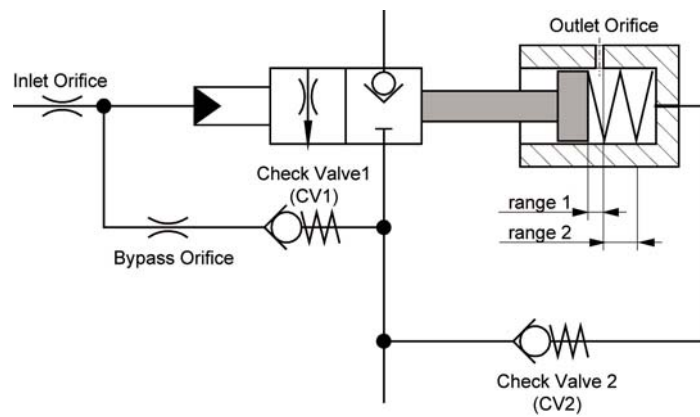
- opening level of the load control valve is independent from the load pressure
- even with high loads there is no sudden reach
- the piston opens with almost no hysteresis and the operator has a quite direct handling of the load



3.3 Stroke depending damping

Inlet and outlet orifice are used for damping the opening of the valve as in conventional load control valves. In addition to that WESSEL load control valves are designed with a stroke depending damping.

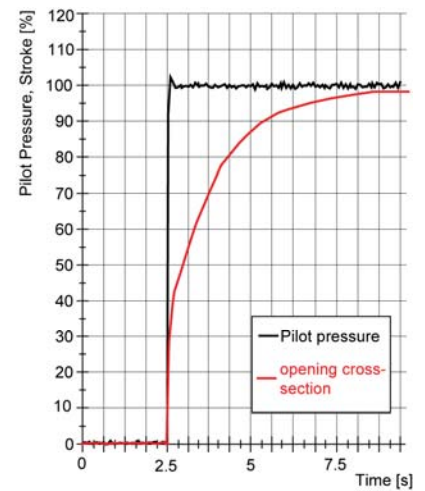
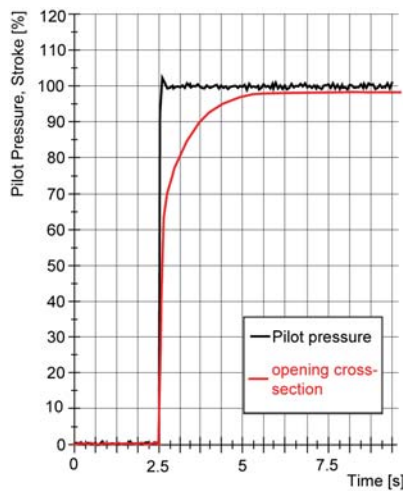
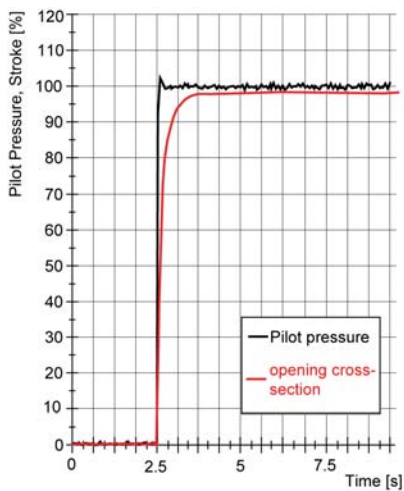
The opening of the valve starts (range 1) with a minor damping via the additional outlet orifice. Further opening (range 2) is done with progressively increasing damping characteristics. A check valve (CV2) guarantees for a quick closing of the valve.



minor damping

medium damping

strong damping

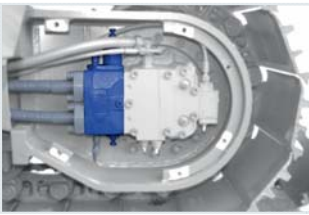


3.4 Type Code

LHW					HYP03B					
00	01	02	03	04	05	06	07	08		
00	Product group Lowering brake check valve						LHW			
01	Design					3N	3P	3D	3T	
02	Connection motor / cylinder	Code 62	SAE 3/4"		SAE 1"		SAE 1 1/4"			
			05C		05E		05G			
03	Control piston (Nominal volume flow at approx. 50bar Δp) l/min		150	200	250	300	350	400	500	600
		1/2"	■	○	○	○	○	○	○	○
		3/4"	○	■	■	■	○	○	○	○
		1"	○	○	■	■	■	■	○	○
04	Pressure setting in bar	Opening level pressure valve at 10l/min						...	350	420
			3N	○	○	○	○	○	○	
			3P	■	■	■	■	■	■	
			3D	■	■	■	■	■	■	
			3T	○	○	○	○	○	○	
05	Activation Hydraulic - proportional						HYP03B			
06	Damping	Orifice selection	minor damping		01					
			medium damping		02					
			strong damping		03					
07	Opening level					in bar	...	014		
08	Shift valve for mechanical brake						0	24S001 24VDC switching Hirschmann cranked plug		
		3N	■	○	○	○	○	○	○	
		3P	■	○	○	○	○	○	○	
		3D	■	○	○	○	○	○	■	

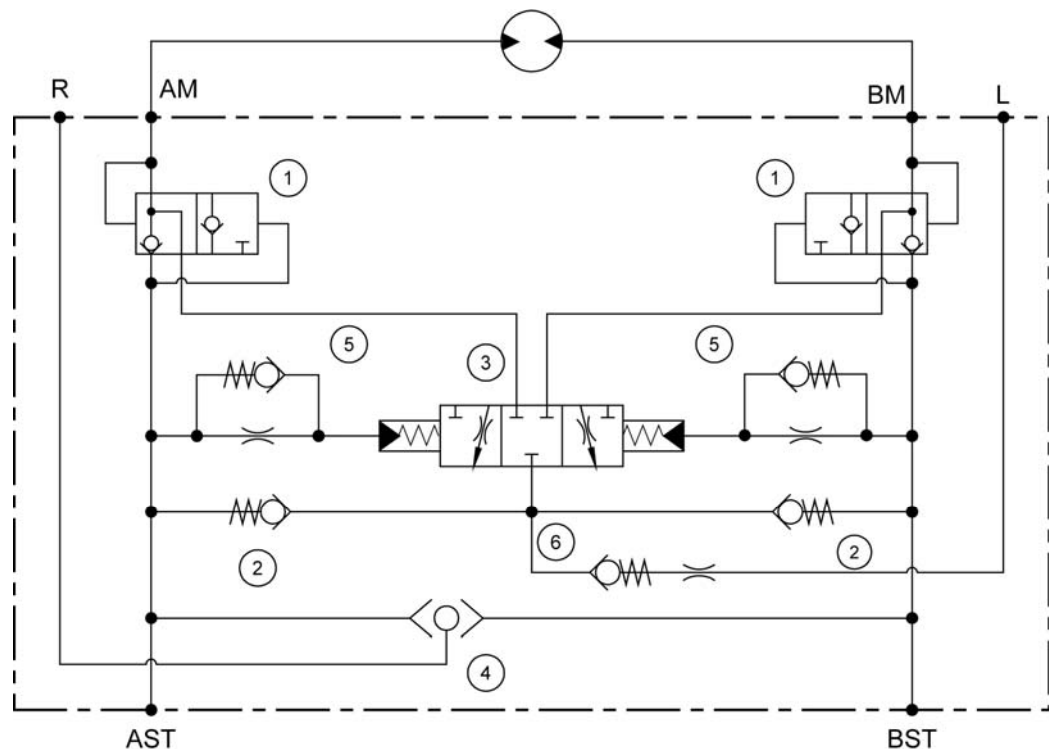
XXX – Predetermined characteristics XXX- Characteristics selectable by customer ■ available ○ not available

4. Brake valves for Travel-, Track- and Winchdrives in open Circuit



Brake valves of this design are used as safety valves for applications as traction motors in wheel- or track excavators, as well as winch motors. They protect the hydromotor against exceeding speed or cavitation in the inlet side when driving downhill or when loads are dragging. The brake valve is designed as a symmetrical spool valve. The inlet flow into the connected hydromotor is routed via patented flow diverters (1). Even with a high damping these flow diverter valves allow a quick reverse of the motor without circulating the oil volume flow through the brake valve's main piston (3). The brakevalve is designed flow-optimized and can be used for volume flows up to 350 l/min with only small pressure losses. That facilitates high driving speed with little power loss. The braking function is regulated between 15 and 40 bar of inlet pressure. The piston motion is damped. Two different damping variants are offered:

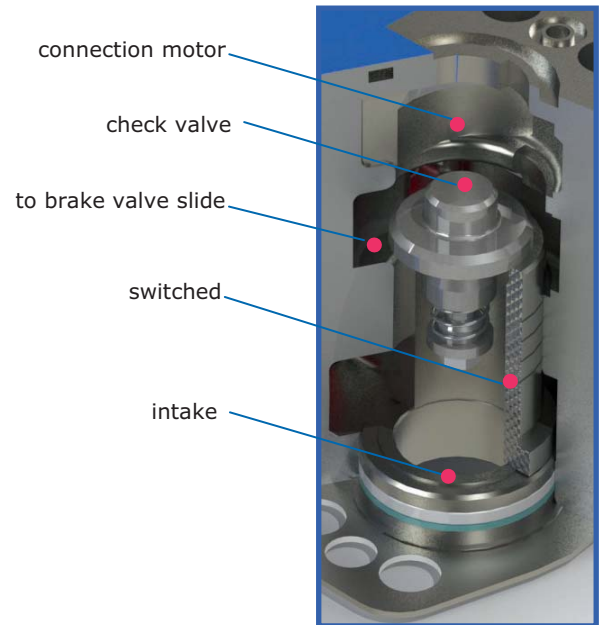
Damped opening (Application: Winches and crawler vehicles) and damped closing (Application: Wheel excavators). Both variants are available as versions with more or less damping capability (5). Versions with considerable damping are additionally equipped with so called cold-start-valves, that ensure a reasonable response time even with cold oil. In case of insufficient oil supply the returning volume flow is fed into the inlet side of the motor via a suction valve (2). A connection for the regulator pressure of the motor via shuttle valve (4) and a leakage port via flush valve (6) are available.



4.1 Description

Patented Flow Diverter (1)

The flow diverter valves allow a quick reverse of the motor without circulating the oil volume flow through the brakevalve's main spool. Therefore the connecting cavity to the brake valve is locked when the inlet check valve opens.



Brake Valve Spool (3)

The main spool for WESSEL Brake Valves is available as for idle position open or for idle position closed. For the usage with drives of wheel excavators or crawler excavators it is recommended always to use a spool with a neutral open design. For winch drive applications a spool with a neutral closed design is imperative. WESSEL Brake Valve spools are offered with optimized designs for different volume flow requirements.



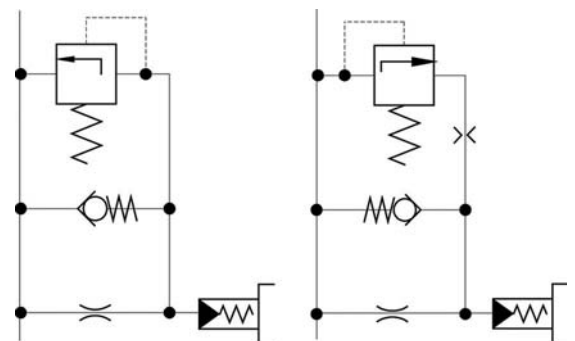
Damping (5)

In the application "wheel excavator" a strong damping might be required: If the foot is taken off the accelerator the excavator should slow down slowly and may not stop abruptly. For this request a damping is offered which only works with the clearance of the spool. In order to achieve a quick response, e.g. during operation at low oil temperature, the damping can temporarily be overridden by means of pressure relief valves.

For the use with track- and winch drives a brakevalve with a damped opening and quick closing feature is recommended.

wheel drives

crawler and winch drives

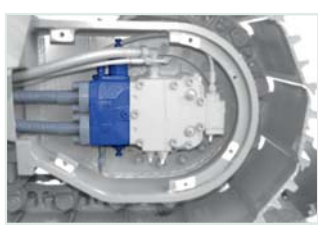


Stroke Limitation

Additionally a piston stroke limitation is available. By this it is possible to throttle back the return flow of the motor in order to synchronize the speed of two crawler tracks.

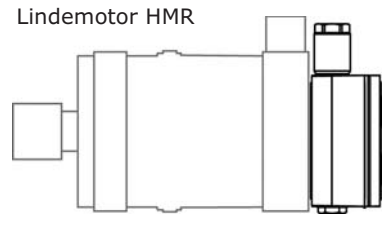


4.2 Connections



1. Direct connection

The brake valve can be flanged directly onto LINDE hydromotors HMR-01 and HMR-02 of the sizes 75, 105 and 135.

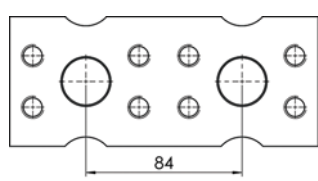


A port for the connection of the motor's regulator pressure is available via a shuttle valve (4) as well as a leakage port for the motor flush via a flush valve (6). As pressure relief valves are strongly recommended for the protection of the motor's inlet ports, it has to be determined, if the hydromotor is already equipped with them.

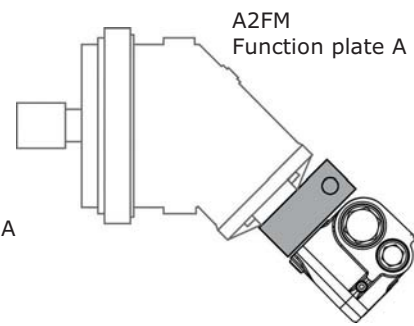
The direct connection is also possible for REXROTH hydromotors A2FM of the size NG80 and NG90.

2. Function plates

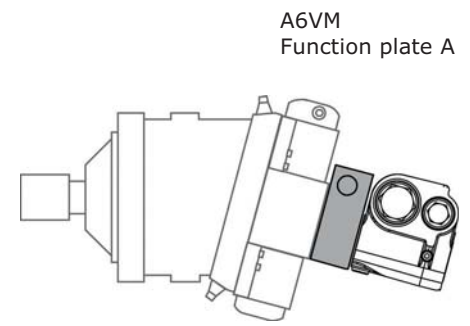
The connection to LINDE and REXROTH hydromotors can also be made by means of a function plate with a flange design as shown in the figure at the side. The utilisation of the function plate together with pressure relief valves protects the motor against too high brake pressure.



Hole pattern of function plate A

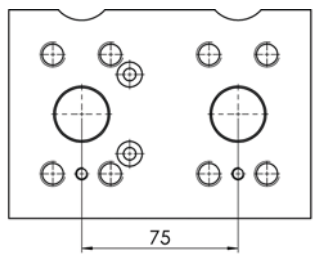


A2FM
Function plate A

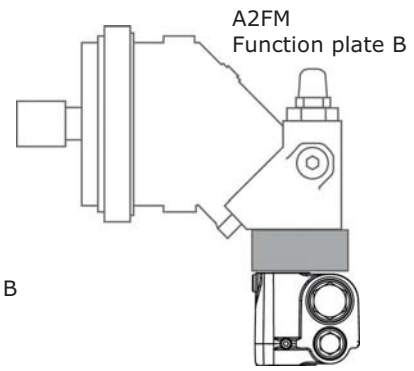


A6VM
Function plate A

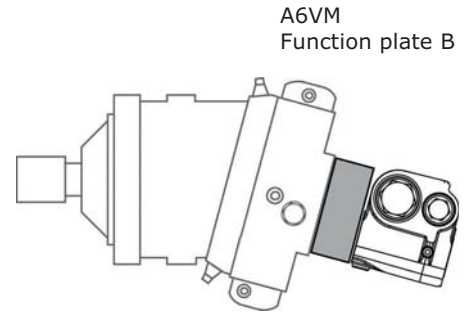
For REXROTH hydromotors with internal pressure relief valves a function plate as shown at the side is available. Regulator pressure and flush oil are provided by the brake valve.



Hole pattern of function plate B



A2FM
Function plate B



A6VM
Function plate B

4.3 Type Code

LBM						
00	01	02	03	04	05	06

00	Product group	LBM
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	Type of connection	Note	Connecting on	Order code
01	Direct connection	Applications which need pressure limiting valves. Check if existent in the motor.	HMR-01 oder HMR-02 BG 75 / 105 / 135	00
		Applications where pressure limiting valves are not necessary	A2FM80/61W-V...010; A2FM90/61W-V...010; A6VM80HZ3... 010; A6VM107HZ3... 010	00
	With function plate A	Contains pressure limiting valves for the protection of the motor	A2FM80/61W-V...010; A2FM90/61W-V...010; A2FM80/61W-V...100; A2FM90/61W-V...100; A2FE80/16W-V...100; A2FE90/61W-V...100; A6VM80HZ3... 010; A6VM107HZ3... 010	A1
	With function plate B	Pressure limiting valves are existent in motor. Function plate contains regulator and flush ports	A2FM80/61W-V...1810; A2FM90/61W-V...1810; A2FM80/61W-VAL 181; A2FM90/61W-V... 181; A6VM80HZ3... 010; A6VM107HZ3... 010	B1

02	Control piston	(recommended for volume flow) l/min	120	180	250
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03	Remaining opening	(orifice in flow diverter valve)	closed (required for winch applications)	00
			open with diameter 1,2	12
			open with diameter 1,6	16
			open with diameter 1,8	18
			open with diameter 2,0	20

04	Damping characteristics	damped opening, strong damping	B1
		damped opening, medium damping (orifice 0,25mm)	B2
		damped opening, minor damping (orifice 0,5mm)	B3
		damped closing, strong damping	C1
		damped closing, medium damping (orifice 0,25mm)	C2
		damped closing, minor damping (orifice 0,5mm)	C3

05	Flushing drain	closed	S00
		open with orifice 2mm	S01

06	Stroke limitation	without stroke limitation	L00
		with stroke limitation	L01

XXX – Predetermined characteristics XXX- Characteristics selectable by customer ■ available ○ not available

5. Functional Safety (EN ISO 13849)

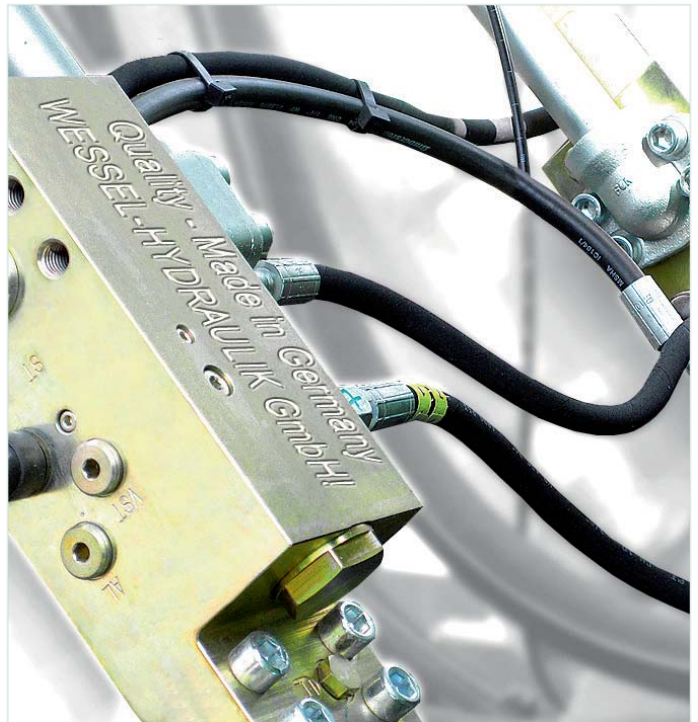
The EN ISO 13849 describes the safety requirements which are demanded for control systems according to the Machinery Directive. If the safety of the machine depends on the correct function of the control unit, one talks of functional safety.

The products listed in this catalogue are suitable for being used in safety related parts of control systems according to EN ISO 13849-1.

150 years may be assumed as MTTFd-value for the listed products in this catalogue.

We as manufacturer confirm using the basic and approved safety principles according to ISO 13849-2, tables C.1 and C.2 for the design of the described components. The not activated valve for example is set in a safe state. On failure of energy supply this state will be taken up again and kept safely.

Appropriate applications and operating conditions for the user are specified in the data sheets. There the user will also be informed about his responsibility to meet the basic and approved safety principles according to ISO 13849-2, tables C.1 and C.2 for the implementation and operation of the hydraulic components.



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